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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/557,621	11/17/2005	Martin Ouwerkerk	NL030570US1	1478

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EXAMINER	
BALL, JOHN C	

ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/557,621	OUWERKERK ET AL.	
	Examiner	Art Unit	
	J. CHRISTOPHER BALL	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 November 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 November 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/17/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Summary

1. This is the initial Office Action based on the OUWERKERK et al. application filed as an International Stage Application under the Patent Cooperation Treaty on May 17, 2004, and now a National Stage Entry ("371") application.

2. Claims 1-11 are currently pending and have been fully considered.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 1-6 and 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over an article by QU et al. ("Microfabrication of Thermoelectric Generators on Flexible Foil Substrates as a Power Source for Autonomous Microsystems", JOURNAL OF MICROMECHANICS AND MICROENGINEERING, vol. 11, 2001, pp 146-152) in view of FERENCE et al. (US 6,630,426 B1) and an article by DEKKER et al. ("Substrate Transfer for RF Technologies", IEEE TRANSACTIONS ON ELECTRON DEVICES, vol. 50, no. 3, March 2003, pp. 747-757).

Regarding claims 1 and 2, QU discloses a method of manufacturing a thermoelectric device comprising:

a flexible foil, in the form of an epoxy (Figure 2), on which two groups of series connected , strip-shaped parts, first element and second element, are provided (Figure 2), where the materials chosen for the two groups of parts, antimony and bismuth, have different thermoelectric coefficient (third paragraph, "2. Module design and material selection" section, p. 147), and said groups of parts are patterned such that the connections between a part of one group and another part of the other group are alternately situated each time in one of two areas of the foil which are situated at a distance from each other (Figure 1);

the strip-shaped parts are provided on a rigid substrate, copper foil (Figure 2);

the foil, epoxy, is provided on the strip-shaped parts (Figure 2); and

the rigid substrate is removed via a wet etching process (second paragraph, "3.3. Embedding and wet chemical etching" section, p. 150).

QU does not teach the rigid substrate is removed in great part by grinding, a rigid carrier plate attached to the foil prior to the removal of the rigid substrate, nor the removal of the rigid carrier plate after the rigid substrate is removed.

However, FERENCE discloses a method of forming a functional film on a substrate and subsequent removal of the substrate, wherein it is taught removal of the substrate can be by grinding, dry etching, wet etching, or chemical mechanical polishing (Col. 10, lines 27-30). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the present invention that grinding and wet etching are substitutable processes for achieving a means of removing a substrate. Additionally, DEKKER discloses transfer of a functional film formed on a substrate to another surface, wherein is taught grinding of the original silicon substrate after gluing a glass, which will function as a carrier plate, on to the functional film (Figure 7). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the present invention to glue a glass plate onto the foil taught by QU because the glass is a mechanical support for the grinding step (DEKKER, second paragraph, "B. A Low-Cost Substrate Transfer Technology for Non-SOI Processes" section, p. 752). It would have been obvious to one of ordinary skill in the art to remove the glass carrier plate after the substrate had been removed to yield the flexible device sought by QU.

Regarding claim 3, modified QU teaches the limitations of claim 1, as outlined above.

QU does not teach attaching the carrier plate to the foil by an adhesive layer and removing the foil by pulling it loose from the adhesive layer.

However, DEKKER teaches the use of an adhesive layer, as a glue, to affix the carrier plate glass to the substrate (third paragraph, "III. Processing Procedure" section, p. 749). It would have been obvious to one of ordinary skill in the art to remove the glass carrier plate after the substrate had been removed to yield the flexible device sought by QU, and pulling the foil loose would be an obvious choice to one of skill in the art.

At the time of the present invention, it would have been obvious to one of ordinary skill in the art at the time of the present invention to glue a glass plate onto the foil taught by QU because the glass is a mechanical support for the grinding step (DEKKER, second paragraph, "B. A Low-Cost Substrate Transfer Technology for Non-SOI Processes" section, p. 752).

Regarding claim 4, modified QU teaches the limitations of claim 3, as outlined above.

QU does not explicitly teach that the adhesive layer is hexandioldiacrylate or the foil is made of polyimide. QU teaches the foil is epoxy (Figure 2).

However, DEKKER teaches the use of an adhesive layer, as a glue, to affix the carrier plate glass to the substrate (third paragraph, "III. Processing

Procedure" section, p. 749). DEKKER does not discloses a specific compound as the adhesive, but does recite that adhesive utilized is a monomer which after cross-linking forms a very hard acrylic (fifth paragraph, "II Substrate Transfer Technology (STT)" section, p. 749).

At the time of the present invention, it would have been obvious to one of ordinary skill in art to utilized hexandioldiacrylate as the adhesive in the method taught by modified QU as hexandioldiacrylate is well-known in the art to a monomer which after cross-linking forms a acrylic layer, as taught by DEKKER. Also, it would have been obvious to a skill artisan to substitute a known element, such as the epoxy as the foil taught by QU, for another known element well-known in the art, such as a polyimide, to yield a predictable result. (*KSR International Co. v. Teleflex Inc., 550 U.S.__, 82 USPQ2d 1385 (2007)*)

Regarding claim 5, modified QU teaches the limitations of claim 1, as outlined above. QU additionally teaches the substrate is made of copper.

QU does not explicitly teach the substrate is made of a semiconductor substrate.

However, FERENCE teaches a silicon substrate (300, Figures 5A-D; Col. 10, lines 7-10) and DEKKER teaches a silicon substrate (Figure 1).

At the time of the present invention, it would have been obvious to one of ordinary skill in the art to substitute a known element, such as the copper as the substrate taught by QU, for another known element well-known in the art, such

as silicon, to yield a predictable result. (*KSR International Co. v. Teleflex Inc., 550 U.S.__, 82 USPQ2d 1385 (2007)*)

Regarding claim 6, modified QU teaches the limitations of claim 1, as outlined above. QU also teaches the materials chosen for the two groups of parts are antimony and bismuth (third paragraph, "2. Module design and material selection" section, p. 147), both of which are semiconductor materials.

Regarding claim 8, modified QU teaches the limitations of claim 1, as outlined above. QU additionally teaches the substrate is made of copper.

QU does not explicitly teach the substrate is made of silicon in which a buried oxide layer is formed.

However, DEKKER teaches a silicon substrate with a buried oxide layer (Figure 1).

At the time of the present invention, it would have been obvious to one of ordinary skill in the art to substitute a known element, such as the copper as the substrate taught by QU, for another known element well-known in the art, such as silicon in which a buried oxide layer is formed, to yield a predictable result. (*KSR International Co. v. Teleflex Inc., 550 U.S.__, 82 USPQ2d 1385 (2007)*)

Regarding claim 9, modified QU teaches the limitations of claim 1, as outlined above. QU additionally teaches that a number of the two series-

connected groups of strip-shaped parts are arranged in parallel between two strip-shaped conductors formed on the foil (Figure 1).

Regarding claim 10, modified QU teaches the limitations of claim 1, as outlined above.

QU does not explicitly teach the foil is folded or coiled.

However, QU does teach the finished thermoelectric generator is thin and flexible, and hence it is capable of shaping to suit different application conditions (first paragraph, "5. Conclusion" section, p.152). Therefore, at the time of the present invention it would have been obvious to one of ordinary skill that the foil could be folded or coiled as necessary for particular applications and that the manner of folding or coiling could be in such a manner that the connections of the two interconnected groups of strip-shaped parts remain in two spaced apart positions as the user application dictates.

Regarding claim 11, modified QU teaches the limitations of claim 1, as outlined above. Therefore, the method as taught would necessarily result in a thermoelectric device as described.

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over an article by QU et al. ("Microfabrication of Thermoelectric Generators on Flexible Foil

Substrates as a Power Source for Autonomous Microsystems", JOURNAL OF MICROMECHANICS AND MICROENGINEERING, vol. 11, 2001, pp 146-152) in view of FERENCE et al. (US 6,630,426 B1) and an article by DEKKER et al. ("Substrate Transfer for RF Technologies", IEEE TRANSACTIONS ON ELECTRON DEVICES, vol. 50, no. 3, March 2003, pp. 747-757) as applied to claims 1-6 and 8-11 above, and further in view of KABAYA et al. (US 3,770,520).

Modified QU teaches the limitations of claim 1, as outlined above.

QU does not teach

QU does not explicitly teach the substrate is made of monocrystalline silicon which is provided with an isolating layer on which a polycrystalline silicon layer is deposited.

However, KABAYA disclose a semiconductor substrate, wherein the substrate is made of monocrystalline silicon which is provided with an isolating layer on which a polycrystalline silicon layer is deposited (Col. 2, line 63 – Col. 3, line 5).

At the time of the present invention, it would have been obvious to one of ordinary skill in the art to substitute a known element, such as the copper as the substrate taught by QU, for another known element well-known in the art, such as monocrystalline silicon which is provided with an isolating layer on which a polycrystalline silicon layer is deposited, to yield a predictable result. (*KSR International Co. v. Teleflex Inc., 550 U.S.__, 82 USPQ2d 1385 (2007)*)

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to J. CHRISTOPHER BALL whose telephone number is (571)270-5119. The examiner can normally be reached on Monday through Thursday, 8:00 am to 5:00 pm (EDT).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nam X Nguyen/
Supervisory Patent Examiner, Art Unit 1753

JCB
06/05/2009